

UTILITY APPLICATION
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FOR
UNITED STATES PATENT
ON
**SYSTEM AND METHOD OF
HEATING SWIMMING POOLS AND SPAS WITH STEAM**

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**System and Method of
Heating Swimming Pools and Spas with Steam**

Field of the Invention

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[0001] The present invention relates in general to water heating systems and, more particularly, to a system and method of heating swimming pools and spas with steam.

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Background of the Invention

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[0002] People enjoy swimming pools and spas for family activities, therapy, exercise, recreation, and relaxation. Swimming pools are less popular in colder climates but still find uses in the summer months and indoor settings. In warmer climates, swimming pools are common in residences, hotels, and health clubs. Spas and hot tubs are found all types of climates.

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[0003] In general, people tend to enjoy pools and spas more when the water is relatively warm. In swimming pools, some people find 75-80°F water to be refreshing. Other people find 85-90°F water to be more comfortable. In spas, the water is generally even warmer in the 100-105°F range. Depending on the time of year and outside air temperature, it is often necessary to heat the pool and spa water to the desired temperature. Most if not all spas and hot tubs include heaters to raise the water to higher temperatures. In swimming pools, heaters have been used to extend the usable season and even make the pool a year-round attraction.

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[0004] Swimming pool and spa heaters come in basic configurations where water is pumped from the main body of water and filtered. The most common types of filters are sand, diatomaceous earth, and cartridge. The

filtered water is routed through heating chambers in the heater before returning to the main body of water. The heater can burn propane or natural gas as an open flame applied to the heating chamber to increase the water temperature. Electricity can also be used as an energy source to power a heating element in proximity to the heating chamber. The heating element transfers heat to the heating chamber which increases the temperature of the return water to the pool or spa. In another embodiment, the return water is routed through solar collectors to increase its temperature.

[0005] A common problem with conventional heating systems for swimming pools and spas is that the user must either keep the water at the desired temperature at all times, even when not in use, or the user must allow for the time needed to raise the temperature to a comfortable level. Keeping the water at a warm temperature continuously increases operating costs, wastes energy, and unnecessarily consumes natural resources. On the other hand, the process of raising the water temperature to a comfortable level when it comes time to use the pool can take a considerable amount of time. If the pool water is initially at a low temperature, say 50°F, it may takes many hours or an entire day to raise the temperature to say 85°F depending on the energy transfer capacity of the heater and volume of the pool water. The pool user must plan ahead to have the pool ready to use at the intended time. The need to plan ahead limits the spontaneity and enjoyment factor associated with pool usage. Many times the user foregoes the use of the pool because it takes too long or requires too much preparation effort.

Summary of the Invention

[0006] In one embodiment, the present invention is a water heating system comprising a steam heater for
5 generating steam. A wand injects the steam into a body of water. A flexible tubing is coupled between the steam heater and wand to transfer the steam from the steam heater to the wand.

[0007] In another embodiment, the present invention is
10 a water heating system for injecting steam into a body of water comprising a network of piping for disposing within a support structure containing the body of water. A plurality of steam ports are coupled to exit points of the network of piping into the body of water. A steam
15 generator provides steam through an outlet which is coupled to the network of piping for transporting the steam to the steam ports and injecting the steam into the body of water.

[0008] In yet another embodiment, the present
20 invention is a method of heating a body of water comprising the steps of providing a network of piping for disposing within a support structure containing the body of water, providing a plurality of steam ports on exit points of the network of piping into the body of water,
25 and generating steam through the network of piping for transporting the steam to the steam ports and injecting the steam into the body of water.

Brief Description of the Drawings

30 [0009] FIG. 1 illustrates a portable steam heater for swimming pools and spas with hand-held wand;

FIG. 2 illustrates the portable steam heater of FIG. 1 with a stand to support the wand;

FIG. 3 illustrates a fixed steam heater with a delivery system integrated into swimming pool and spa;

FIG. 4 illustrates a portable steam heater and detachable coupling to the delivery system of FIG. 3;

5 FIG. 5 illustrates a dual water heating system; and

FIG. 6 illustrates block diagram of the steam heater.

10 **Detailed Description of the Drawings**

[00010] Referring to FIG. 1, a steam heater system 10 is shown for heating a body of water 12. Swimming pools, spas, and hot tubs are examples of body of water 12 and range in size from few hundred gallons for spas to 20,000-40,000 gallons or more for swimming pools. In the interest of clarity, the elements shown in the figures are representative of the described function and are not necessary drawn to scale.

20 [00011] People find enjoyment in the use of swimming pools, spas, and hot tubs for family activities, therapy, exercise, recreation, and relaxation. While water-based activities are less popular in colder climates, these recreational facilities are still commonly used in the summer months and indoor settings. In warmer climates, swimming pools are found in residences, hotels, and health clubs. Spas and hot tubs are found all climates. The present invention involves the use of steam to rapidly heat swimming pool and spa water. By heating the water with steam, the swimming pool and spa can be heated very rapidly at will and only when needed thus saving energy and conserving natural resources.

30 [00012] Steam heater or generator 14 draws energy from energy source 15 to generate steam. Energy source 15 may

be natural gas, propane, or other fossil fuel. Energy source 15 could also be electrical or solar. Steam heater 14 draws water from pool 12 through pipe or flexible tubing 16. Alternatively, steam heater 14 could get its water from an external water supply. The combination of energy from energy source 15 and water from pool 12 allows steam heater 14 to generate superheated steam, i.e. steam above the boiling point of water. The steam is transferred through flexible tubing 18 to gun or wand 20. Tubing 18 is made from non-corrosive material such as stainless steel having flexible linkages. Gun 20 is configured to be hand-held with a hand grip 22 and trigger assembly 24. An operator holds hand grip 22 in one hand and operates trigger assembly 24 with his or her index finger. The second hand grasps barrel 26 for control and stable operation. The non-corrosive conduit continues through grip 22 and barrel 26 to transfer the steam to exit point 28. Barrel 26 is made from graphite, plastic, or other polymer material for insulation from the superheated steam. Tubing 18 is also insulated to protect the operator from the hot steam.

[00013] The operator positions gun 20 such that exit point 28 is underwater in pool 12. The operator then squeezes trigger 24 and causes steam to flow from steam heater 14 through tubing 18 and gun 20. The steam is injected directly into pool 12. The application of superheated steam to pool 12 causes the temperature of the water to increase rapidly. For example, in a 15,000 gallon pool with 212°F steam injected into pool 12, the water temperature increases at a rate of 10°F per hour with a steam mass flow rate of 1300 lbs/hr. In the case of a 500 gallon spa, steam heater system 10 producing the same 212°F steam will increase the water temperature at a

rate of 60°F per hour with a steam mass flow rate of 260 lbs/hr. The rate of increase in water temperature in pool 12 is much greater with steam injected into the water as compared to conventional pool heating systems.

5 Steam heater system 10 provides a significant convenience for the operator and user of pool 12 in that the body of water can be heated much more rapidly making the swimming pool or spa ready for use with shorter notice. The rate of increase in water temperature is even greater with
10 superheated steam greater than 212°F. The swimming pool and spa is heated at will very rapidly and only when needed thus saving energy, natural resources, and maintenance over heating systems that heat the water continuously.

15 **[00014]** Steam heating system 10 is a portable unit. Steam heater 14 and energy source 15 can be attached to a cart or dolly 30 with wheels or rollers 32. Tubing 16 can be a flexible hose that is readily moved and laid over the edge into pool 12. Tubing 18 and gun 20 are
20 part of the portable unit. The portable steam heater can be moved from place to place by pushing cart 30 by hand. A motor and steering assembly 34 can be attached to cart 30 for maneuvering heavier capacity steam generating equipment. The operator controls motor and steering
25 assembly 34 to drive cart 30 to the desired location. The portable steam heater system 10 is useful for hotels, clubs, and municipal pools that have more than one swimming pool or spa to maintain. One steam heater system 10 can service multiple swimming pools and spas.

30 **[00015]** Another feature of portable steam heater system 10 is shown in FIG. 2. Elements having a similar function are assigned the same reference number. In this case, wand or gun 20 is supported by brace or stand 40. For larger bodies of water which take longer to heat, or

in situations where the operator does not want to hold the hand-held version of gun 20, brace 40 supports gun 20 while the steam is injected into pool 12. Gun 20 is positioned in support channel 42 on brace 40 with exit point 28 well underwater and then locked or clamped securely in place. Trigger assembly 24 is engaged and locked and the superheated steam is pumped into pool 12. The operator can observe from a comfortable distance or perform other duties while the water temperature of pool 12 is brought to the desired temperature. A warning sign can be placed on brace 40 to avoid accidents and prevent injury to swimmers, guests, and passersby when the steam heating process is underway.

[00016] Another steam heater system 50 is shown in FIG. 3. Pool 12 is built or modified to have a plurality of steam ports 52. Steam ports 52 are positioned at regular intervals around the side walls well under the waterline or along the bottom of pool 12. Steam ports 52 include a jet or orifice for injecting the steam into the water. Each steam port 52 also include a protective cover 53 that re-directs the steam-heated water and allows some area for cooling. The steam strikes protective cover 53 and is re-directed sideways into the main body of pool 12. The steam-heated water cools rapidly when mixed with the pool water. Thus, by using protective covers 53, swimmers and bathers are never directly exposed to the superheated steam jets.

[00017] A network of non-corrosive pipes or conduit 54 is contained within the support structure of pool 12 and connects steam heater 56 to steam ports 52. The support structure includes the soil, rebar, concrete, gunite, decking, and inner pool surface which forms the shell of pool 12. The network of pipes 54 and steam ports 52 with protective covers 53 constitute the steam delivery system

integrated into the swimming pool and spa support structure.

[00018] In one embodiment, steam heater 56 is a fixed unit, permanently coupled to pipes 54. Water is drawn from pool 12 through tubing or pipe 58 for steam heater 56. Energy source 60 provides energy to heat the water from pool 12. The energy source can be electrical, solar, natural gas, propane, and other fossil fuel. The heated water is converted to steam. In a fixed configuration, steam heater 56 and energy source 60 are hidden behind a wall 64 for safety and aesthetic appearance. In the unlikely event that steam heater 56 should fail or burst, wall 64 will provide safety and protection for against serious injury to people.

[00019] The operator engages steam heater 56. Energy from energy source 60 boils the water under pressure to create superheated steam. The steam flows from steam heater 56 through the network of pipes 54 and is injected into pool 12 through steam ports 52. The steam is injected directly into pool 12 in and around protective covers 53. The application of superheated steam to pool 12 causes the temperature of the water to increase rapidly. Again, the rate of increase in water temperature in pool 12 is much greater with steam injected into the water as compared to conventional pool heating systems. The distributed steam ports 52 of steam heating system 50 along the sidewalls or bottom of pool 12 provides a convenient and safe mechanism for injecting steam directly into the pool.

[00020] A significant portion of the cost for steam heating system 50 is attributable to steam heater 56 and energy source 60. For installations having multiple swimming pools and spas, a portable version of the steam heating system allows the unit to be moved around and

shared. Accordingly, as shown in FIG. 4, steam heater 56 and energy source 60 are housed in portable cart 30. A detachable coupling 66 is provided for quick and easy connect and disconnect between steam heater 56 and pipes 54. The portable steam heater system is maneuvered around and connected via detachable coupling 66 to pipes 54 for different swimming pools and spas as needed.

[00021] In some applications, the steam heater system is the primary and sole heating source for the swimming pool and spa. In such cases, the steam heater system will replace the conventional pool heater. The rapid heating cycle of the steam heating system gives the user the option of not heating the swimming pool and spa during non-usage time. For example, residential swimming pools and spas are generally not heated at night and during the work week. In many situations, no one is using the swimming pool and spa during those times. A significant amount of energy can be saved by not heating the pool and spa water when not in use. When the user wants to heat the swimming pool and spa water, he or she fires up the steam heating system and raises the water temperature to a comfortable level in a short time. The steam heating system can be engaged during the weekends when the pool and spa are regularly used.

[00022] In other applications, especially in multiple pool and spa installations, a dual water heating system such as shown in FIG. 5 is used. A conventional water heating system is capable maintaining the water at a given level. Water is pumped from pool 12 by pump 70 and run through filter 72 and conventional heater 74 back to pool 12. In a dual water heating system, steam heating system 10 or 50 is used as a booster heating system to rapidly increase the water temperature to the desired level. In other words, given that the swimming pool and

spa water is initially cold, the portable steam heater 50 is positioned and utilized to rapidly heat the water to a comfortable temperature. Once the water temperature reaches the desired level, the conventional heater 74 takes over to keep the pool water at the desired temperature. Portable steam heater 50 is disengaged or taken away. Heater 74 can be a smaller unit since it is only maintaining the water temperature that steam heating system 50 has established. In multiple pool and spa installations, the portable steam heating system 50 is taken to the next pool or spa to repeat the rapid preheating process. Again, once the water temperature reaches the desired level, the conventional heating system takes over and maintains the water temperature. The portable steam heater system is moved to the next job. The dual water heating system is convenient in multiple pool and spa installation in that the portable steam heating system 50 does not have to be repeatedly moved from location to location to continuously re-heat the water. Steam heater system 50 is used for its primary purpose, i.e. to rapidly preheat the pool and spa water and then allow the conventional heater 74 to take over.

[00023] Further detail of the steam heater is shown in FIG. 6. Using steam heater 56 as an example, a boiler 80 receives water from tubing 58. Boiler 80 is heated from energy source 60. An open flame from the burning natural gas or an electrical heating element boils the water under pressure in boiler 80 to generate steam. By increasing the temperature of the steam past 212°F, the steam becomes superheated. The steam in boiler 80 is kept at a temperature of 240°F and pressure of 10 PSIG. The superheated steam is release by valve 82 into the network of pipes 54.

[00024] In another embodiment, the steam heater can be implemented with an instant steam generator. The instant steam generator receives a continuously supply of water. Air is driven into a mixer-burner, combined with fuel,
5 and ignited in a chamber. The water is sprayed into the hot gases exiting the chamber to create instant steam. The water is instantly converted to super-heated steam in an efficient manner. A blower provides a force behind the steam to move it rapidly down the conduit to the
10 swimming pool.

[00025] A person skilled in the art will recognize that changes can be made in form and detail, and equivalents may be substituted, for elements of the invention without departing from the scope and spirit of the invention.
15 The present description is therefore considered in all respects to be illustrative and not restrictive, the scope of the invention being determined by the following claims and their equivalents as supported by the above disclosure and drawings.

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